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Study on Egg Productivity of Guinea-Fowls (*Numida meleagris*)

Research Article

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ABSTRACT

A study on the egg productivity of pearl-gray guinea-fowl from the Bulgarian local population was carried out over three consecutive laying years – 2016, 2017, and 2018. Egg-laying started at 39 weeks of age and the production cycle was 31, 30, and 25 weeks for one-, two- and three-year-old layers, respectively, the average egg-laying intensity being 70.11, 44.22, and 32.81%, depending on the fowl age. The following characteristics were established for the three studied ages of the layers: mean egg weight – 41.59 ± 0.13, 42.31 ± 0.12 and 38.49 ± 0.23g; shape index – 76.32 ± 0.19, 76.54 ± 0.15 and 77.96 ± 0.20%; egg yolk weight – 13.58 ± 0.06, 14.03 ± 0.05 and 12.62 ± 0.08g; egg albumen weigh – 49.09 ± 0.13, 48.00 ± 0.15 and 51.35 ± 0.24 g and shell weight – 18.23 ± 0.10, 18.88 ± 0.08 and 15.05 ± 0.65g, respectively. The univariate analysis with least significant difference (LSD) test has shown significant differences in egg-laying intensity in guinea-fowl comparing the different seasons and productive years. The same analysis has revealed significant differences in the morphological characteristics of guinea-fowl eggs during the varying seasons and depending on the age of the layers. Taking into account the significant decrease of Guinea fowl egg production in their second and third laying years under an uncontrolled microclimate of the habitat for table eggs production, it is recommended to use guinea hens for a year for commercial production of eggs for consumption.

KEY WORDS egg-laying productivity, egg morphology, Guinea-fowl.

INTRODUCTION

Guinea-fowl egg production has not been developed worldwide. The reason for that is not so much the lack of traditional egg-laying industry rather than the pursuit of higher meat yields of that fowl species, which is considered an indisputable delicacy and what is more, quite useful for human health. However, that type of eggs, in terms of the quantitative and qualitative content of fatty acids, cholesterol, amino acids, and oligo and trace elements, have the characteristics of a nutritional supplement to a much higher degree than quail and pheasant eggs (Nickolova, 2013; Angelov, 2018). Compared to the hen species, guinea-fowls start laying eggs later and have lower egg productivity.

Indigenous guinea fowl start laying eggs between 28 and 42 weeks of age, with 15 to 20 eggs being laid each season (Ayeni, 1980). Guinea fowl propagation period in their natural distribution range begins in August and lasts for about two months. Domestic guinea-fowl starts laying eggs at 28-32 weeks of age depending on their breed, husbandry, and environment (Hien, 2002). Guinea-fowl layers could be used for 7 years or more (Ayorinde, 1990). The period of use of the parent flocks, however, should not exceed two years, since after the second production year the number of eggs is significantly reduced (by 10-20% in the second and by 30-35% in the third laying year). According to Ayorinde (1990), the duration of the production period during the first laying year is 38-40 weeks in an intensive production system and 28-33 weeks in semi-intensive technologies. Under extensive rearing conditions, the duration of the laying period is 22-25 weeks. Other authors reported that under the conditions of extensive and semi-intensive production systems, the reproduction period lasts for 22 weeks (Royter and Guseva, 1987; Royter, 1991). Ayorinde *et al.* (1989) recorded a 9-month reproduction period, in which 80-90% of the eggs were laid between April and September.

The guinea-fowl species is characterized by high egg-laying intensity (Nickolova, 2009; Nickolova *et al.* 2010; Kabakchiev *et al.* 2014; Penkov and Nikolova, 2016). Depending on the breeding level and the rearing system, guinea fowl egg production varies within a wide range–from 70 to 220 eggs (Janda, 1978; Julius and Seth, 1983; Abiola, 1997; Krystianiak and Rosiński, 2008; Nickolova, 2009; Arabi, 2013). According to Ayeni (1983), guinea-fowl reared under a controlled microclimate produce 40 to 100 eggs per season in the first year and during the second year they can lay up to 180 eggs. The laying season lasts about 7 to 8 months (Maccarthy, 1974; Chrappa *et al.* 1978).

Over the last two decades, the quality of guinea-fowl eggs was the subject of extensive research by a large number of authors from different countries (Bernacki and Heller 2003; Kuzniacka *et al.* 2004; Oke *et al.* 2004; Nowaczewski *et al.* 2008; Ahmed *et al.* 2009; Dudusola, 2010; Wilkanowska and Kokoszynski, 2010; Obike *et al.* 2011; etc.).

That is largely determined by the fact that the incubation results are strongly influenced by eggmorphological characteristics, such as the weight, shape, thickness and shell porosity, and egg albumen quality (Benton and Brake, 1996; Narushin and Romanov, 2002).

Taking into consideration the valuable nutritional composition and the highest delicate (taste, culinary) qualities of guinea-fowl eggs, we set the aim of studying egg productivity of the pearl-gray guinea-fowl hens from a local Bulgarian population and to figure out the appropriate duration of raising in free-range for egg production.

MATERIALS AND METHODS

Materials

The experiment was carried out with a total of 75 young (39 week-old) pearl-gray guinea-fowl hens from a local Bulgarian population. The poultry was reared in a free-range system, in light-type polymer premises opened to free-range yards and fed on compound feed for guinea-fowl laying hens, containing 11.73 MJ/kg metabolisable energy (ME) 16.5% crude protein (CP), 0.80% lysine, 0.46% methionine, 0.71% threonine, 0.16 tryptophan, 4.01% calcium and 0.44% available phosphorus.

Methods

The investigation was conducted over three productive years (2016, 2017, and 2018) from the beginning of February to the end of September each year (31 weeks). The meteorological data were provided by the Agroecological Center of Agricultural University - Plovdiv, Bulgaria.

The following characteristics were studied: a period of reaching 10% of the egg-laying capacity, egg-laying intensity and the length of the laying period, average laying capacity per layer, and morphometric parameters of the eggs. Daily control of egg production was performed during the experiment. Morphological egg characteristics were reported weekly on 10% of the eggs laid, picked randomly. The measured characteristics included: egg weight and shape, weight and percentage of protein, yolk, and shell, from which the egg structure, Haugh units, egg yolk color (visually by Roche scale), and shell thickness were determined. The weights of egg, yolk, albumen, and shell with the membranes were measured with an OHAUS-2000 electronic scale with an accuracy of ± 0.01 g. The shape index (Is) was calculated by the formula:

$$I = d/D \times 100$$

Where:
d: small egg diameter, cm.
D: large diameter, cm.

Haughunits were determined by the formula:

$$HU = 100 \log (H + 7.57 - 1.7 \times W^{0.37})$$

Where:
H: height of the thick albumen.
W: egg weight.

The large and small diameters of the egg, the yolk and albumen diameters and the height of the thick albumen were measured with a caliper of 0.01 mm accuracy.

Statistical processing of the data

The univariate analysis with least significant differences test (LSD) was applied to establish the effect of the productive years and varying seasons onto the egg-laying intensity of guinea-fowl hens based on the mean values of laid eggs for the investigated periods. The same analysis was used to evaluate the morphological characteristics of guinea-fowl eggs during the varying seasons and depending on the age of the layers. Significant differences were tested and $P < 0.05$ were considered statistically significant. The results were processed with SPSS Statistics 17.0.0 WinWrap Basic, Copyright 1993-2007 software (SPSS, 2007).

RESULTS AND DISCUSSION

Egg-laying intensity

The egg-laying intensity in the three productive years is shown in Figure 1 and Table 1. Presented data show that the guinea-fowl hens in the experiment began to lay eggs at 39 weeks of age, reaching 10% of laying capacity at the beginning of the second week and 50% – in the third. The guinea hens reached an average laying capacity of 139.71 eggs in their first productive year with an average intensity of 70.11%. The production period in the first year of laying was 31 weeks in the studied population, which is close to the period, reported by all the other authors in the available literature (Royter and Guseva, 1987; Ayorinde *et al.* 1989; Royter, 1991; Nickolova, 2009).

In the second year, the laying cycle lasted for 30 weeks with average egg productivity of 89.70 eggs (64.20% of the egg productivity in the first year) and an average laying intensity of 44.22%. In the two-year-old birds, 50% of egg-laying capacity was reached again in the third week. The three-year-old guinea-fowl hens reached only 32.81% of laying intensity and the average egg production was 79 eggs (56.55% of the egg production in the first and 88.07% of the egg production in the second laying year). The third egg production period was 25 weeks. The authors have assumed that the drastic shortening of the laying period and the decrease in the egg-laying intensity could be explained by the age changes of the reproductive system of the layers. As has been noted in the introduction part, the species of guinea fowl usually do not breed for egg production.

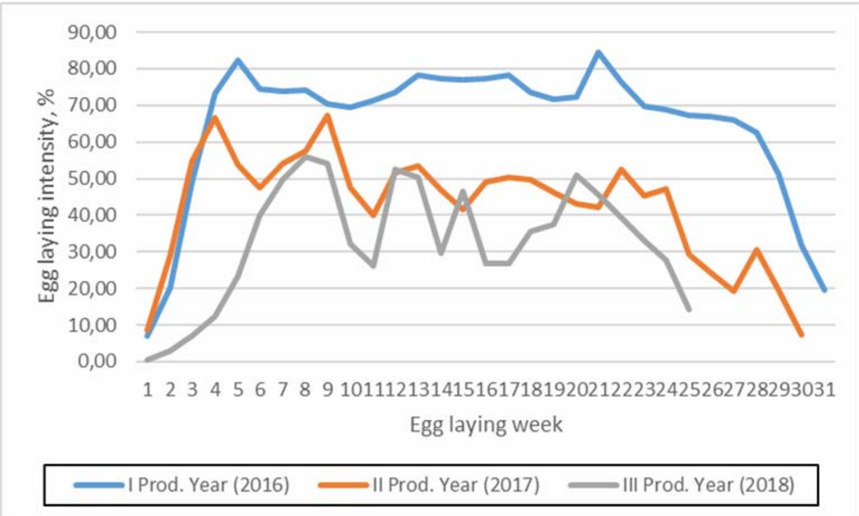

Figure 1 Egg laying intensity of local guinea-fowl hens

Table 1 Influence of the productive years and varying seasons onto the egg-laying intensity of guinea-fowl hens[1,2]

Productive year (PY)*		Productive year (PY)/season**	
	$\bar{x}$±SD		$\bar{x}$±SD
I PY(2016)	70.11±10.77[ac]	I PY Spring- autumn	64.76±14.89[gi]
II PY (2017)	44.22±13.99[ab]	I PY summer	73.57±4.99[im]
III PY (2018)	32.81±16.30[bc]	II PYSpring- autumn	46.06±19.11[gh]
		II PY summer	43.04±9.91[jk]
		III PYSpring- autumn	27.79±21.53[hi]
		III PY summer	36.16±11.27[km]

[1] Test: least significant differences test (LSD), based on the mean values of egg-laying intensity by years and by seasons.
[2] Significant differences were tested and P < 0.05, as follows: a: between 2016 and 2017; b: between 2017 and 2018; c: between 2016 and 2018; d: between spring 2016 and summer 2016; e: between spring 2017 and summer 2017; f: between spring 2018 and summer 2018; g: between spring 2016 and spring 2017; h: between spring 2017 and spring 2018; i: between spring 2016 and spring 2018; j: between summer 2016 and summer 2017; k: between summer 2017 and summer 2018 and m: between summer 2016 and summer 2018.
* Coefficient of determination R^2= 0.570 (corrected coefficient of determination R^2=0.559).
** Coefficient of determinationR^2= 0.599 (corrected coefficient of determination R^2=0.573).

In reproductive herds, guinea fowls are used for one egg-laying year (Ayeni, 1980). According to a study done by the authors, there is a lack of literature data as a confirmation for the usage of guinea fowl for egg production in the third year and the reasons for reducing the egg-laying intensity. Table 1 also shows the effect of the factors season and productive year on the intensity of egg-laying. During the first productive period, the egg-laying intensity was 64.74% during the transition seasons (spring-autumn) and 73.57% in summer. Two distinct peaks of laying were recorded with values of 82.28 in the 5th and 84.64% in the 21st week of laying. A comparatively high intensity, varying between 70.35% and 78.17%, was observed between the two peaks, the intensity falling below 50% only after the 29th productive week. That fact, along with the long productive period, explained the high average laying intensity of the flock in the first productive year. In the second egg-laying year the results obtained showed an opposite tendency. The laying intensity was higher in spring-autumn (46.06%) compared to summer (43.04%). In the second year, the experimental birds reached the first peak (66.78%) in the 4th week. After a slight decrease for 2 weeks, the laying intensity increased and reached 67.11%, resulting in a second peak in the 9th productive week. After the two peaks, an intensity of 39.87% to 52.49% was maintained for quite a long time. Only after the 24th week of the productive period, the egg-laying intensity decreased, ending in the 30th week at 7.32%. The three-year-old guinea hens showed uneven egg-laying activity with multiple but low peaks: 56.02 at 8th week, 52.63 at 12th, 46.43 on 15th, and 50.89% at the 20th productive week, which explained the significant decrease of egg-laying at that age. The authors suppose this is most likely a result of the age-specific changes of the ovary of the three-year-old layers which is not confirmed in the accessible literature. Higher laying intensity was observed during the summer months, compared to spring: 36.16 *vs.* 27.79%.

As a result of the univariate analysis carried out by the LSD method for the three studied years, the significant p-values (<0.05) proved that the effect of the productive year on the observed characteristic – the intensity of egg-laying, was statistically significant (Table 1). There were statistically significant differences between the mean values of the egg-laying intensity during the different seasons for all three investigated years. There were no significant differences between spring-autumn and summer seasons within one productive year (2016 – P-value= 0.097; 2017 – P-value= 0.566; 2018 – P-value= 0.134).

The analysis of coefficients of determination for the three experimental years shows that 57.0% of the variations in the intensity of egg-laying were due to the effect of the productive year and 59.9% of the variations – to the influence of the different meteorological characteristics of the seasons (Table 1).

Morphological characteristics

Table 2 and Table 3 show the mean values of the major morphological characteristics of the eggs for the three experimental years. The biological significance of egg size is determined to the greatest extent by its effect on embryogenesis and, in particular, on heat production during incubation (Lourens *et al.* 2006). The average egg weight of guinea-fowl in the first production year was 41.59 g, the shape index was 76.32%, the absolute and relative albumen weights: 20.43 g and 49.09%, the absolute and relative yolk weights: 13.58 g and 32.57% the Haugh units 84.11, the absolute and relative shell weights: 7.58 g and 18.23%, respectively, and the average shell thickness was 0.52 mm (Table 2). Egg morphometric characteristics in the second productive year had the following values: weight – 42.31 g, shape index – 76.54%, absolute and relative weights of egg albumen: 20.31 g and 48.00%, absolute and relative yolk weights: 14.03 g and 33.22%, Haugh units 87.37, absolute and relative shell weights: 8.00 g and 18.88%, respectively, and the average shell thickness was 0.50 mm (Table 2).

The three-year-old layers produced eggs with the following characteristics: egg weight – 38.49 g, shape index – 77.96%, absolute and relative weights of egg albumen: 12.62 g and 32.83%, absolute and relative weights of egg yolk: 19.78 g and 51.35%, Haugh units – 91.93, absolute and relative weights of egg-shell: 5.80 g and 15.05%, respectively, and the average shell thickness was 0.45 mm (Table 2). Regarding the season (Table 3), the egg weight varied from 42.46 g (two-year-old layers) to 38.57 g (three-year-old) during the transitional seasons and from 42.20 g (two-year-old) to 38.39 g (three-year-old) in the summer. The highest egg weight was reported in the second productive year in the spring-autumn season: 42.46 g. The lower weight (40.77 g) in the same season of the first productive year is explained by the incomplete growth of the young fowl at the beginning of the egg-laying cycle. The lowest values of that characteristic were established in the three-year-old laying hens (an average of 38.49 g), which, along with the lower laying intensity at that age (Figure 1 and Table 1), according to the assumption of the authors is indicative of pronounced ovarian senile dystrophy. As has been mentioned above in the available literature, there is a lack of data about two-year-old and three-year-old laying hens. The poorly expressed tendency of lower egg weights during the summer of the second and third productive years was due to the lower utilization of feed nutrients at higher summer temperatures (compare to the other seasons - Table 4) under the conditions of the free-range poultry rearing system in the present experiment.

Table 2 Morphological characteristics of guinea-fowl eggs, depending on the age of the layers[1,2]

Productive year (PY)	Egg weight (g)	Egg shape (%)	Yolk weight (g)	Yolk weight (%)	Yolk colour
		$\bar{x}$±SD			
I PY(2016), n=372	41.59±2.45^{ab}	76.32±3.67^{ab}	13.58±1.12^{ab}	32.57±2.73^{ab}	8.29±1.81
II PY(2017), n=372	42.31±2.36^{ac}	76.54±2.95^{ac}	14.03±0.87^{ac}	33.22±2.00^{ac}	8.37±1.26
III PY(2018), n=198	38.49±3.18^{bc}	77.96±2.78^{bc}	12.62±1.09^{bc}	32.83±2.08^{bc}	7.80±1.81

Productive year (PY)	Albumen weight (g)	Albumen weight (%)	HU	Shell weight(g)	Shell weight (%)	Shell thickness (mm)
			$\bar{x}$±SD			
I PY(2016), n=372	20.43±1.79	49.09±2.54^{ab}	84.11±9.50^{ab}	7.58±0.86 ^{b}	18.23±1.88^{ab}	0.52±0.10^{ab}
II PY(2017), n=372	20.31±1.68	48.00±2.86^{ac}	87.37±5.45^{ac}	8.00±0.91^{ac}	18.88±1.59^{ac}	0.50±0.06^{ac}
III PY(2018), n=198	19.78±2.24	51.35±3.43^{bc}	91.93±4.02^{bc}	5.80±3.65^{bc}	15.05±9.21^{bc}	0,45±0.07^{bc}

[1] Test: least significant differences test (LSD).
[2] The differences are statistically significant at $P < 0.05$ as follows: a: between 2016 and 2017; b: between 2016 and 2018 and c: between 2017and 2018 for all investigated characteristics separately.
SD: standard deviation.

Table 3 Morphological characteristics of guinea-fowl eggs, depending on the different meteorological characteristics of the seasons[1,2]

Productive year (PY) / season	Egg weight (g)	Egg shape (%)	Yolk weight (g)	Yolk weight (%)	Yolkcolour
		$\bar{x}$±SD			
I PY spring-autumn, n=160	40.77±2.65^{bc}	76.18±3.71	13.22±1.18^{bc}	32.45±2.32^{b}	8.28±1.75
I PY summer, n=212	42.20±2.08^{cf}	76.43±3.65^{f}	13.85±0.98^{acf}	32.66±3.00^{a}	8.30±1.85^{f}
II PY spring-autumn, n=160	42.46±2.39^{b}	76.06±2.36^{d}	13.97±0.85^{b}	32.94±1.86^{bd}	8.31±1.49
II PY summer, n=212	42.21±2.34^{f}	76.90±3.28^{df}	14.08±0.88^{afg}	33.43±2.08^{adg}	8.42±1.05^{g}
III PY spring-autumn, n=112	38.57±3.21	77.24±2.94^{e}	12.62±1.22	32.74±1.77	7.71±1.97
III PY summer, n=86	38.39±3.17^{fg}	78.89±2.26^{ef}	12.61±0.9^{fg}	32.95±2.44^{g}	7.92±1.59^{fg}

Productive year (PY) / season	Albumen weight (g)	Albumen weight (%)	HU	Shell weight (g)	Shell weight (%)	Shell thickness (mm)
			$\bar{x}$±SD			
I PY spring-autumn, n=160	19.80±1.78^{bc}	48.54±2.52^{bc}	88.93±8.68^{c}	7.74±0.83^{bc}	19.01±1.73^{bcf}	0.58±0.11^{bc}
I PY summer, n=212	20.91±1.64^{acf}	49.51±2.47^{acf}	80.47±8.42^{acf}	7.45±0.87^{acf}	17.64±1.77^{ac}	0.48±0.06^{c}
II PY spring-autumn, n=160	20.23±1.57^{b}	47.62±2.27^{bd}	89.96±5.05^{d}	8.26±0.91^{bd}	19.43±1.57^{bdg}	0.52±0.06^{bd}
II PY summer, n=212	20.38±1.77^{a}	48.27±3.21^{adg}	85.41±4.90^{adf}	7.81±0.87^{adg}	18.47±1.48^{ad}	0.49±0.07^{d}
III PY spring-autumn, n=112	19.18±1.88^{e}	49.73±2.56^{e}	92.53±3.50^{e}	6.15±4.79	15.94±12.13^{e}	0.47±0.07^{e}
III PY summer, n=86	20.56±2.42^{eg}	53.46±3.27^{efg}	91.18±4.51^{efg}	5.34±0.76^{fg}	13.89±1.39^{efg}	0.42 ±0.05^{e}

[1] Test: least significant differences test (LSD).
[2] The differencesare statistically significant at $P < 0.05$, as follows: a: summer 2016 and Summer 2017; b: spring-autumn 2016 and spring-autumn 2017; c: spring-autumn 2016 and summer 2016; d: spring-autumn 2017 and summer 2017; e: spring 2018-summer 2018; f: summer 2016-summer 2018 and g: summer 2017-summer 2018.
SD: standard deviation.

Table 4 The mean temperatures during the experimental weeks for the three productive years (from the beginning of February to the end of September) relative to average temperatures for Bulgaria at that period[1]

Year / season		Temperature, ˚C			
		Mean ± SEM	SD	Min	Max
I PY(2016)	Spring-autumn	14.26±0.38	5.58	6.9	24.8
	Summer	25.06±0.22	2.82	20.05	28.95
II PY(2017)	Spring-autumn	16.09±0.36	5.32	9.55	27.0
	Summer	25.5±0.33	4.24	16.8	34.8
III PY(2018)	Spring-autumn	15.79±0.35	5.05	7.8	23.5
	Summer	25.39±0.31	3.89	17.2	32.5

[1] Meteorological data were provided by Agroecological Center of Agricultural University - Plovdiv, Bulgaria.
SEM: standard error of the means and SD: standard deviation.

The mean summer temperatures during the examined periods for the three productive years relative to average temperatures for Bulgaria presented in Table 4 were varied between 25.06 ± 0.22 and 25.5 ± 0.33 ˚C, with maximum (34.8 ˚C) and minimum (16.8 ˚C) deviations, respectively.

However, the egg weight was not drastically lower and it is statistically insignificant, which shows the good resilience of the species to extremely high outdoor temperatures. That was also confirmed by the egg-laying peaks during the summer period, especially in the first year (Figure 1). Significantly higher egg weight values for pearl gray guinea-fowl (46.70 g) were reported by Song *et al.* (2000). High values were also reported in the studies of Wilkanowska and Kokoszynski (2010) with white guinea-fowl – 46.50 g. Shahi *et al.* (2007) – 40.80 g and Kuzniacka *et al.* (2004) – 40.10 g obtained results, which were closer to the results in the present study for the same color variation of the species. Nowaczewski *et al.* (2008) established a significantly higher egg weight in French broiler lines – 55.30 g.

Guinea fowl eggs are characterized by a more rounded shape, which is reflected in the higher shape index value – over 76.00%. Its average annual values varied from 76.32% (first productive year) to 77.96% in the third productive year (Table 2). The shape index was 76.54% in the two-year-old hens. A statistically significant increase in the shape index was found with the age increase. The more rounded eggs of adult guinea-fowl are attributed to the senile anatomy and physiological changes in the reproductive system of the birds. In the transitional spring-autumn season the values ranged from 76.06% (second productive year) to 77.24% (third productive year). In the summer months of the three productive years, the values of the studied characteristic were, as follows: 76.43% in the first, 76.90% in the second, and 78.89% in the third productive year, respectively (Table 3). A more rounded egg shape was observed in the hot summer months, which was more pronounced with the age increase. The most elongated eggs were obtained in the summer of the second productive year – 76.06% and the most rounded – in the summer season of the third year – 78.89% (Table 3).

The absolute albumen weight ranged from 19.18 g in the cold months to 20.91 g during the summer. The tendency to an increased albumen weight in the summer was established during the first two years and in the third, the increase was statistically significant.

An increase in the absolute and relative weight of the yolk was reported during the summer season in the first two years of the study, as well as in the second productive year compared to the first one. For the three-year-old layers, there was a statistically significant decrease in the yolk weight. Haugh units ranged from 80.47 in the summer to 89.96 in the cooler months. That was observed in both productive years. The reason is most likely due to the higher temperature, which caused quicker evaporation of the egg water content. The shell weight (absolute and relative) had the highest values in the spring-autumn season of the second productive year, and the shell thickness – in the same season of the first year (0.58 mm) (Table 3).

Table 2 shows that guinea-fowl eggs, compared to the eggs of other poultry species, are characterized by a high share of the shell – over 18%, as well as by the high percentage of yolk – 32.57-33.22%. The yolk percentage in the egg structure was the highest in the second year (33.22±0.10%), which was statistically significant, and the egg-shell share was the lowest in the third year (15.05±0.65%), the difference being statistically significant. The relative share of the egg albumen was the lowest in the second year (48.00±0.15%) and the highest in the third one (51.35±0.24%), with statistical significance. The seasonal variation in the relative share of the yolk was low, except for the summer season of the second productive year when the yolk percentage was the highest (33.22±0.10%). The albumen share in the egg structure shows a statistically significant increase during the summer compared to the transitional seasons during the three years of the study, that being most pronounced in the third year (53.46±0.36). An opposite tendency was observed for the egg-shell, i.e. a significant decrease in its relative share in the summer season compared to spring, the greatest decrease being established in the third productive year.

CONCLUSION

The start of egg-laying in this study of the pearl-grey local guinea-fowl population was established at the age of 39 weeks and 50% of laying capacity was reached in the third productive week in one- and two-year-old layers and in the seventh week in the three-year-old fowl. As a result of the investigation was defined the production cycle for the three studied years was 31, 30, and 25 weeks, respectively. Egg productivity, expressed by the intensity of laying and the average number of laying eggs, as well as the length of the production period, have been decreased which is particularly pronounced in three-year-old birds. The analysis of the coefficient of determination for the three years showed that in the free-range system of poultry breeding, egg production performance was influenced by the production year (57.0%) and the climatic characteristics of the seasons (59.9%), the influence of both factors being almost equal.

The drastic shortening of the productive period and the decrease in egg production capacity during the third productive cycle is explained by the changes in the reproductive system of the layers with the age. However, this is only the authors' assumption which is not confirmed in the accessible literature. For that reason, the authors are going to continue this investigation to justify reproductive decline through histological, hormonal, or other studies. Besides, work on this experiment will continue with the goal to develop models describing the effect of the major meteorological factors (air temperature and humidity, wind speed, precipitation, and cloud cover) on egg productivity of Guinea fowl using the regression analysis methods in combination with principal component analysis (PCA). In Conclusion, taking into account the significant decrease in egg production at two- and especially at three years of age under an uncontrolled microclimate of the habitat, it is recommended that the guinea hens be used for one year for commercial production of eggs for consumption. However, the breeding flocks could be used for two productive years, depending on the value of the birds.

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